Accelerator Systems Division Highlights Ending December 17, 2004

ASD/JLAB: Cold Linac

The H-2 cavity string assembly is complete. The string is leak-tight and will be transferred for cryomodule assembly when a rail becomes available. This completes assembly of cavity strings for the Spallation Neutron Source project.

The 2 K cold box, transfer lines and 5 cryomodules were cooled to 2 K.

ASD/BNL: Ring

ASD's C. Deibele, J. Pogge and A. Webster were at BNL to meet with Tom Russo and members of the BNL/SNS Diagnostic Team.

The repaired IPM chambers have been returned from Central Shops. Our Vacuum Group is in the process of cleaning, leak testing and bake-out prior to TiN coating.

Equipment received at SNS/OR from our vendor, IE Power:

- 800V 1400a Pulsed Power Supplies (2)

All of the SNS electron detectors have been qualified. Techs will perform a final leak test before shipping to SNS/OR.

The following BNL equipment was received at SNS/OR on Monday: Injection doublet assembly #1 and its lifting fixture; the repaired #1 injection septum magnet; QMM kicker; tune kicker; damper kicker; a spare 36cm BPM (for the target harp assembly).

Leaving today by soft ride truck: RF #4; RF stand; PA and rack; anode PS; BLM Ion Chambers; BLM / VME chassis; HEBT vacuum VME crate.

Extraction Lambertson Septum (Alpha Magnetics) – The circulating beam tube has arrived at BNL from Alpha and passed preliminary leak check. The tube has been cleaned and placed in the vacuum furnace for bake-out prior to TiN coating next week.

RTBT bend magnet (17D224) – Pioneer Steel is on track to deliver the magnet steel to BNL by January 1st.

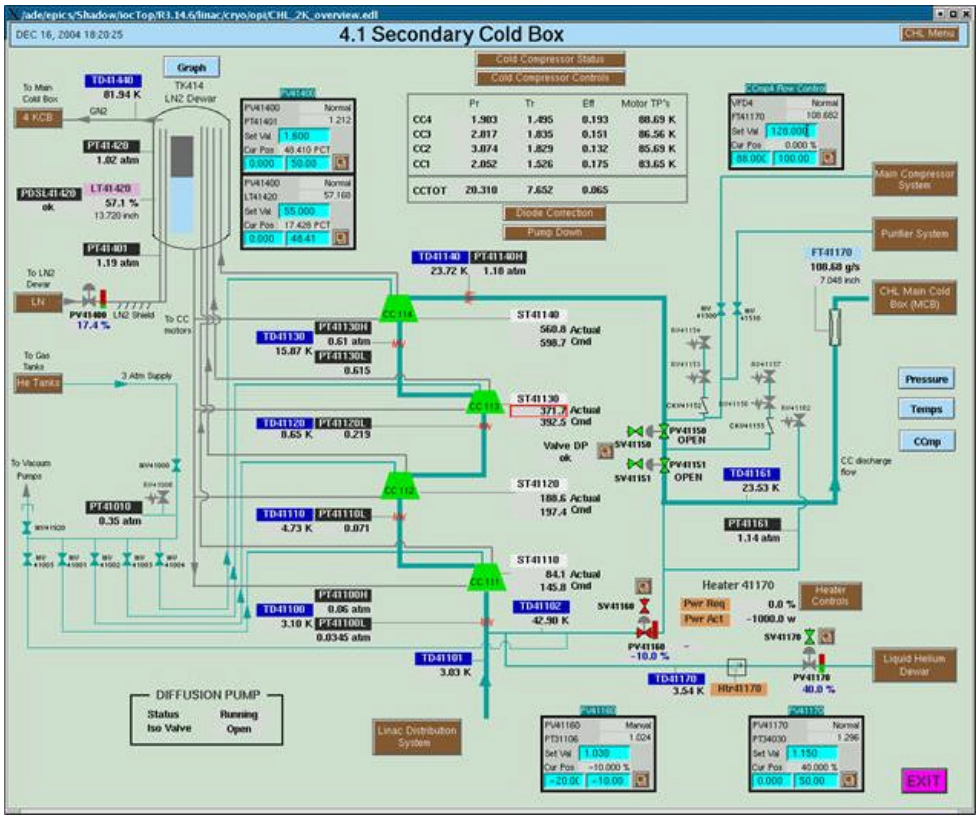
Magnetic measurements of the first 36Q85 radiation hardened quadrupole were completed this week. The magnet was "accepted" by the BNL/SNS AP Group. Magnet #2 is being is being prepared for testing.

Controls

The controls team continued to support the reliability run this week. Pilar Marroquin of the SNS controls team at LANL visited ORNL to install and commission the integrated Residual Gas Analyzer system, after which he presented a demonstration and training sessio0n for personnel from the vacuum, controls and operations groups.

Work continued on installation and termination of under-floor cables for the Central Control Room (CCR). Power cables are complete and communications cables should be complete by the end of the month. A console prototype should also be ready by month's end. A console test stand was set up in the software development laboratory (formerly Target Control Room) adjacent to the CCR.

The ICS cryogenic control system supported the commissioning of the Central Helium Liquefier 2.1 K Cold Box. Data was properly archived. Control loops and interlocks performed as required. Medium Beta cryomodules 3, 4, 5, 6, and 7 were cooled to ~2.1 k as can be seen in the 2K HX LP Inlet TD_023 temperature for MB03 and MB04. The screen snapshots were taken a short time before the lowest pressures and temperatures were reached.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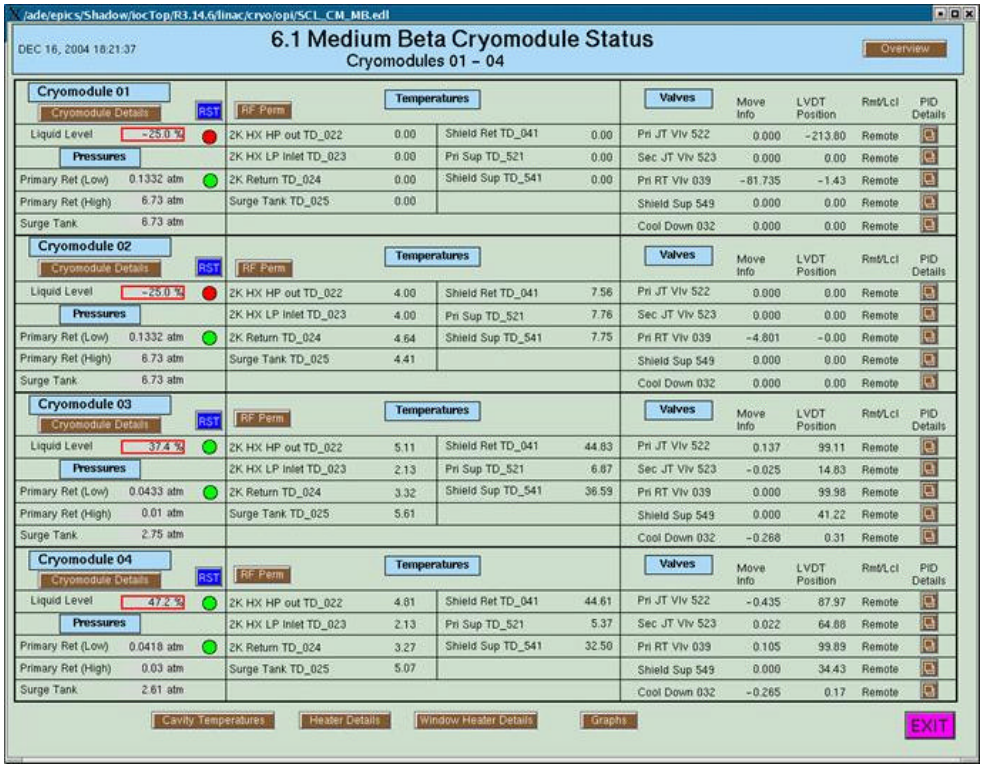
4.1 Secondary Cold Box
CHL Menu
Graph
Cold Compressor Status
Cold Compressor Controls
Diode Correction
Pump Down
Main Compressor System
Purifier System
CHL Main Cold Box (MCB)
Pressure
Temps
COmp
Heater Controls
Liquid Helium Dewar
Linac Distribution System
DIFFUSION PUMP
Status Running
Iso Valve Open
EXIT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DEC 16, 2004 18:21:37
6.1 Medium Beta Cryomodule Status
Cryomodules 01 – 04
Overview
Cryomodule 01
Cryomodule 02
Cryomodule 03
Cryomodule 04
Cryomodule Details
RST
RF Perm
Temperatures
Valves
Move Info
LVDT Position
Rmt/Lcl
PID Details
Liquid Level
Pressures
Primary Ret (Low)
Primary Ret (High)
Surge Tank
2K HX HP out TD_022
2K HX LP Inlet TD_023
2K Return TD_024
Surge Tank TD_025
Shield Ret TD_041
Pri Sup TD_521
Shield Sup TD_541
Pri JT Vlv 522
Sec JT Vlv 523
Pri RT Vlv 039
Shield Sup 549
Cool Down 032
Remote
Cavity Temperatures
Heater Details
Window Heater Details
Graphs
EXIT

Power inspections needed to authorize applying power to HEBT Service Building controls racks were completed this week. AC power cabling to controls racks in Ring Service Building was also inspected. A sketch and instructions on how to finish these racks, including vacuum racks with IOCs and PLCs, was issued

A P&ID was completed that shows all site cooling water systems with appropriate measurements being recorded in EPICS. Agreement was reached with operations on what alarms and additional screens we are required to effectively run the system. Work to build these screens and alarms is underway.

It is now possible to have independent timing for each LLRF system when two systems share one VXI crate, as is the case throughout the SCL. An improvement was made to avoid the error that often reduced the RF gate width to zero on initial boot-up, and another to turn off the adaptive feed-forward when the setpoint is small enough. Improvements were made to the "HAL" Field Control Module software to add a resonance error calculation and to throttle waveform updates to be synchronous with beam pulses.

Vacuum systems for Cryo modules MB3-8 were signed off to start RF testing this week. Check out of MB9-11 has begun. The ION pumps and cold cathode gauges have been changed over to the vacuum rack in the klystron gallery for MB9-11. A problem with MB10 remains to be understood.

Work continued this week on the installation of PPS cabling in the target building, starting with the PPS cabling to the 2TU outbuilding for beamline 2. A cable schedule has been developed along with an SRO. A significant amount of new tray will be required to be installed in the outbuilding prior to cable installation. This work is being coordinated with the XFD installation manager. Work also continues on the design for TPPS equipment. Additional drawing packages for access control to the transfer cell and basement utility vaults were approved this week. 50% of the drawing packages are now approved with the design work 75% complete on the remaining equipment design.

The Personnel Safety Team (PST) supported a UPS power outage this week that affected the LINAC PPS and ODH system. Significant effort was required to support the operational planning for this outage, as cryogens were present in the LINAC tunnel during the outage. Watch standers were required to monitor the LINAC tunnel during the outage and the PPS and ODH system engineers will inspect and test their systems prior to placing them back into service at the conclusion of the outage.

PPS field work in the HEBT service building and entry station is 75% complete. Resolution of issues from the PPS design review has begun. In particular, control philosophy for critical devices – the HEBT turning dipoles and DH-13 in the RTBT.

The last 3 BLM IOCs were shipped from BNL this week. This completes BNL's BLM efforts. The Ring and RTBT PS configuration has been finalized. Some changes were required due to a change in the position of the RTBT ground break in the vacuum pipe, and moving some HEBT corrector power supplies from the Ring mezzanine to the Ring Service Building floor. This should complete BNL's power supply efforts. The first of the three vacuum IOCs was also shipped this week. This IOC is for the HEBT, which will be used in the upcoming SCL run.

Work began on compiling a list of MPS inputs in the Ring Service Building. Identification of these inputs is the last thing holding up completing the communications cable design for the Ring Service Building.

Work continued on the LEBT chopper controller. Test features were added to the FPGA code and communications methods for the configuration interface of the "next generation chopper controller" were developed. Using techniques developed for the next generation chopper controller a proposal for a new MPS networking architecture is under study.

A new software driver for the "Beckhoff" fieldbus is running successfully in a test rack and will be deployed in the field in the weeks to come.

EPICS version R3.14.7 was deployed on all of the development and production EPICS servers.
This version resolves many channel access bugs and was due to a lot of trouble-shooting and analysis with Jeff Hill at LANL. At the same time, VxWorks version 5.5.1 was deployed on all development and production servers. This new version of VxWorks resolves many compiler bugs and was due to coordination/consultation with WindRiver.

Work began on the port of the JLab "channel access nameserver" to EPICS R3.14. This package will be tested and deployed at the SNS as a tool to reduce the number of Channel Access broadcasts, leading to a less chatty network with respect to PV searches.
The new release of MATLAB was installed on all servers to support the physics group new applications that require MATLAB Release 14.

Installation

Craft Snapshot 12/14/04

ASD productive craft workers	**70.0**
Foremen (Pd by 15% OH)	6.0
AMSI management (Pd directly)	3.0
TOTAL AMSI WORKERS	79.0
Less WBS 1.9, 1.2 etc	**18.0**
Less absent	**2.0**
TOTAL PD BY ASD/ORNL DB WPs	**50.0**

Accelerator Physics

SCL production. The cavity string for CM HB12 is out of the clean room and into the Cm assembly area. Only the string for HB2 (former electropolished cavities) now remains to be assembled.

Preparations for testing are continuing. 5 Cryomodules (Positions M3-M7) are now cold. 2K operation was achieved in the evening of 12/16, but the testing will occur at 4.2 K, where the operation of the CHL is a lot simpler to maintain. All the relevant parameters of cavities and cryomodules' performance are expected to be measured at this temperature, based on the experience on CM M3.

Now that the CM's are cold, final low power measurements are being performed and the waveguides from the klystrons to the cavities will be connected over the next few days, so that testing can proceed over the Holidays. CM M7 has a leak into the insulating vacuum, the origin of which is being investigated. The cold cathode gauge of cavity M4b is not functioning properly. That cavity will not be powered until the nature of the malfunction has been understood and resolved.

Coverage for testing over the Holidays is in place.

Operations

Running shifts in support of:

- Operability Run
- Beam Operations
- Cryogenic cooldown

New Control Room policy:

- All personnel working in and around the CR must wear badges
- All personnel working around the Radiation Controlled areas FE Must wear TLDs.

DOE-ORO is examining Accelerator Operations at ORNL. SNS has been asked for a self assessment. Operations will be working on this.

Operating Statistic for the week (Wednesday to Wednesday):

Machine On Time	108
Machine Startup	6
Planned Shutdown	41.5
Radiation Monitoring/Tunnel Sweep/PPS	
Equipment Breakdown	12.5
	168
RF	4.95
Power Supplies	2
Cryogenics	1.25
Controls	0.5
Vacuum	3.8
Total Downtime	12.5

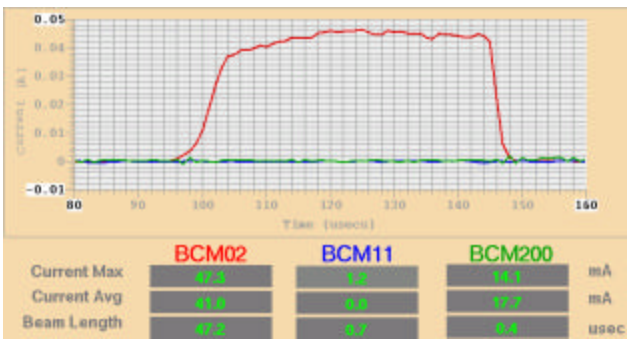
Working with ASD Controls and PSSO on CUB alarm limits and data archiving

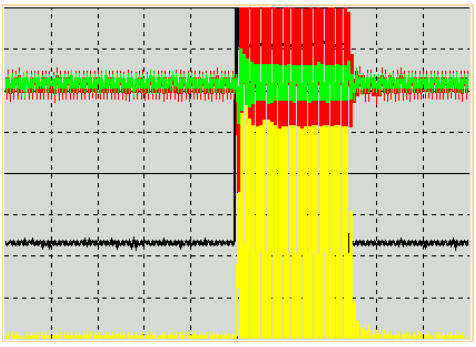
Working on the SNS Transition to Operations plan

Working on the Maintenance Management System, in particular Equipment Tracking and uploading equipment structures into DataStream.

Ion Source

The ceramic antenna flange broke 3 days after it was installed. The antenna flange was replaced. A first cesiation produced over 40 mA, but the beam decreased over a two day period. A second cesiation brought the beam again to over 40 mA with very little decrease over a several day period. To square up the puls e the matching network was set at 41.5% much lower than the 47% that minimizes the reflected power (green trace). This mismatch generates an initial overshoot of the antenna current (yellow trace), which accelerates the plasma breakdown.





Robert Welton presented his work on cesiation to the physics group

Survey and Alignment

S&A rough aligned the quadrupole magnets on two warm section rafts located in the CLO. Once beam pipes are installed, the magnets will be final aligned with the beam pipe in the ring before being installed in the beam line.

Two additional 8Q35 warm section quadrupole magnets were fiducialized.

S&A aligned the quadrupoles and the beam pipe on two warm section rafts located at the North end of the Ring. We will align them to final position once installed in the beam line.

Laid out the 24 additional bolt holes in the upstream injection area.

During some routine layout work between A-arc and B-arc, some apparent deformation was discovered. Since this region is very close to one of the filled construction-induced dropouts, a small network re-observation survey has been planned and scheduled for this area, to discover the exact nature and extent of this deformation.

The monthly RTBT recompression settlement observations were processed early this week. This month we saw another 0.96 mm of settlement at the interface, so the floor at that point now lies 7.101 inches below design elevation.

The additional settlement this month is less than half the settlement we measured last month at the interface. The heavy magnets stored in this area were removed two weeks ago, and this may have played some role.

For the fourth month in a row, the monthly settlement rate for monuments upstream of the truck entrance is statistically undetectable. In fact, if anything, there might actually be a very small ongoing height increase in this area.

The monitoring points immediately adjacent to the interface (but on the target slab) are still rising at a consistent 0.3 - 0.4 mm/month. This effect has added up to a height increase of 1.0 mm since the beginning of September.

S&A aligned instrument line # 4's shutter glass guide in the shutter housing inside the alignment hut of the Target Building.

We performed an as-built of the hot cell rotating door and the information has been sent to the appropriate personnel. They are concerned that the shear plates are not in the same orientation which is putting undo stress on the door's bearings and shaft

Mechanical

Water Systems Installation

- Installation of the HEBT tunnel magnet cooling system continued.
- Installation of the RING SB power supply cooling system continued.
- Installation of the RING SB power supply cooling system pump upgrade continued.
- Installation of the RING SB power supply cooling system make-up water supply continued.
- Installation of the SCL Warm Section Magnet cooling started.

Ring Systems Installation

- The Ring Injection straight section upstream Doublet Magnet assy was received and staged for installation.
- The repaired Ring Injection straight section Injection Septum Magnet assy was received and staged for installation.
- The Ring Injection Long Kicker Magnet was leak tested and a suspect seal replaced.
- The Ring Collimator straight section QMM kicker, Tune Kicker and Damper Kicker diagnostics were received and staged for assembly.
- The Ring arc heavy cable installation continued.
- The RTBT crane rail/support system was successfully load tested and returned to service.
- The RTBT /Target Wire scanner 36 cm Beam Position Monitor was received.
- The Ring Injection Dump (RID) beam window, support and associated shielding was received and staged for installation.

Magnet Task

This week we installed MB07 and MB08 Warm Sections. We now have a total of six warm sections installed. MB09 is ready to move in and MB10 is being aligned.

Electrical Group

Four additional power supplies arrived from IE Power this week; the final injection kicker supply and the final 3, 900A, 80 V supplies. Only 18 power supplies remain to be delivered. They are all scheduled to arrive in the next 3 months.

All HEBT corrector magnet power supplies have been connected to magnets and tested. At the direction of the Physics Group, polarities of some of these magnets were changed from their original specification to conform to the linac steering convention.

All electrical connections have been made to SCL warm section #3 magnets in preparation for integrated testing. Magnet plastic shields arrived. With all of the equipment in the SCL warm sections, shielding the magnet leads with a reasonable sized shield appears unfeasible. We will revert to the original configuration of exposed leads (no shields). Magnet testing will be done behind a fixed barrier as is planned in the HEBT, Ring RTBT. Once testing is complete, the barriers will be removed and LOTO will apply, with no work on or near without LOTO.

Connected test power supply for magnet measurement group.

Completed wiring for SCL HB1, 2, 3 cryomodules.

SCL ME4 area – turned on power for RF group. Area electrical installation is largely complete.

SCL ME5 area – working on ac power connections, tunnel terminations.

SCL ME6 area – installing racks and ground planes in klystron gallery.

SCL ME8 area – started rack installation and magnet cable pulls.

HEBT - PPS work

Ring – AC power terminations continuing for RF systems

CLO – control room installation continues.

HPRF

SCL ME3: Completed high power testing of all 12 klystrons up to saturation at 69 kV cathode voltage. RF leakage and X-ray surveys were satisfactory.

MB 3-6 cryo-modules baseline parameters have been measured. HPRF techs are connecting the waveguide to the couplers in preparation for high power cryomodule testing next week

SCL ME 3 is ready, RF available for all MB cryomodules and 3 cavities of 1st HB module.

Working on SCL ME 4.

Final cold cavity measurements and waveguide connections to MB 4,5,6,7 will be performed over the next 6 days.

Working on RFTF for Thales 402.5 testing in Feb.

Final ring RF system arriving by years end.

Ring RF

- I have generated the connection lists that the electrical team will need to complete the AC power connections.

LLRF

Cryo Group

Beam Diagnostics